STATEMENT OF BASIS

PROPOSED REMEDY SELECTION FOR SOIL AND GROUNDWATER

AT

FORMER GIBSON ENVIRONMENT FACILITY
EPA ID # CAD 043 260 702

475 Seaport Boulevard
Redwood City, California 94063
San Mateo County

by
Department of Toxic Substances Control
Hazardous Waste Management Program
Standardized Permitting and Corrective Action Branch

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EXECUTIVE SUMMARY

The California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) has prepared this Statement of Basis for the remedy selection for soil and groundwater at the Former Gibson Environmental Services, Port of Redwood City Facility (Facility, or Site). The Facility is located at 475 Seaport Boulevard, in Redwood City, San Mateo County, California (Figure 1). Gibson handled federal Resource Conservation and Recovery Act (RCRA) hazardous wastes and therefore was a RCRA hazardous waste facility. USEPA in 1992 granted authorization to DTSC to administer the state hazardous waste management in lieu of the federal RCRA.

The objective of the California corrective action process at a hazardous waste management facility is to identify releases of hazardous waste or constituents requiring further investigation; to evaluate the nature and extent of the releases; and to identify, develop and implement appropriate corrective measures to protect human health and the environment. Figure 2 is a schematic of the overall RCRA Corrective Action Process and shows the progression from a RCRA Facility Assessment (RFA) through Remedy Selection, and Corrective Action Completion.

The Site is a former liquid bulk terminal (LBT) that was active between 1963 and 1995. Texaco developed and operated the facility from 1963 to the late 1980s for the storage, loading and unloading of gasoline, diesel and jet fuel. From 1992 to 1995, the Site was operated by Gibson Environmental Inc. (Gibson) as a hazardous waste treatment and storage facility under the grant of an Interim Status Document (ISD) signed by DTSC on April 27, 1992. Gibson stored and treated oily hazardous waste in regulated tanks and ancillary equipment. The structures are pictured in Figure 3.

Gibson abandoned the Site in 1995. The Port of Redwood City (Port), as the land owner, is responsible for closure of the regulated units operated under the ISD and corrective action/cleanup of releases from the solid waste management units (SWMUs). To recover portions of the cleanup costs incurred from potentially responsible parties under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C Section 9601, the Port has requested DTSC use terminology and make reference to the CERCLA process and terminology as set forth under the National Contingency Plan (NCP).

A SWMU is defined as any discernable waste management unit, e.g. tanks, containers, etc. at a hazardous waste management facility from which hazardous constituents might migrate, irrespective of whether the unit was intended for the management of solid and/or hazardous waste. The ISD regulated units are hazardous waste treatment and storage equipment regulated under the California Code of Regulations, Title 22, Division 4.5, and Chapter 15.

Since 1999, interim measures/response actions have been conducted, as approved by the Department of Toxic Substances Control (DTSC) including removal of the approximately 10

million gallons of abandoned hazardous wastes from the aboveground bulk storage tanks and evaluation of releases to the soil and groundwater.

The RCRA Facility Investigation/Site Remedial Investigation and other previous investigations concluded that petroleum and metal bearing wastes from former facility operations have contaminated the soil and groundwater. The petroleum related contaminants in shallow soil and/or groundwater predominately include jet fuel, gasoline and diesel, some of which are present as free-phase and residual product, also referred to as light non-aqueous phase liquids (LNAPL). Because the LNAPL represents the greatest amount of chemicals of concern (COCs) at the Site, removal of the LNAPL in the vicinity of the Truck Rack Area is one of the main remediation goals of the project.

Several areas requiring remedial action or engineering controls were identified based on the calculated risk-based cleanup levels for the risk drivers, namely benzene and tetrachloroethene (PCE). These response areas include: 1) Truck Rack Area (general LNAPL area) on the south central portion of the Site; and 2) Three hot spot areas including (a) the Petrox Tank Area, (b) the 6,000-gallon UST area, and (c) GWP-9 located southeast of Tank 30953.

The four (4) remedial alternatives evaluated are as follows:

1. Alternative 1-No Further Action;

2. Alternative 2- cap LNAPL Area and Hot Spots and monitor groundwater and soil gas;

3. Alternative 3- install extraction trenches, cap LNAPL Area and Hot Spots and monitor groundwater and soil gas; and

4. Alternative 4 -excavate LNAPL Area and Hot Spots; perform enhanced biodegradation and monitor groundwater and soil gas.

The nine criteria for evaluating Corrective Measure alternatives are to assure that the selected remedy:

1) Be protective of human health and the environment;
2) Attains media cleanup standards;
3) Controls the sources of releases;
4) Meets all applicable waste management requirements
5) Short- and long-term effectiveness;
6) Reduction of toxicity, mobility and/or volume;
7) Long-term reliability;
8) Implementability; and,
9) Cost.

Although Alternative 4 has the highest anticipated cost of the alternatives evaluated, it meets the remedial objectives and allows greater possibilities for the Site to be redeveloped. Alternative 4 is recommended because it provides the greatest overall protection of human

health and the environment and compliance with ARARs. DTSC's proposed remedies include Alternative 4 and a land use covenant restricting future land uses to commercial or industrial uses only.

The Port of Redwood City (Port) is the lead agency for preparing the environmental analysis for both the proposed closure activities and remedies. The Port has prepared an Initial Study and a Draft Negative Declaration in compliance with the California Environmental Quality Act (CEQA). The CEQA Initial Study evaluates the potential environmental impacts of the proposed remedies and Closure Plan activities. The Port will accept public comment on the Draft Negative Declaration during a 30-days public comment period.

The public will have the opportunity to comment on the proposed remedy selection during a DTSC's 45-day public comment period. The public will also have the opportunity to comment on the Draft Closure Plan for the closure of units regulated under the ISD concurrent with the 45-day comment period for the proposed remedy.

At the end of comment period, DTSC will prepare the Response to Comments on Draft Closure Plan and proposed remedies and the Port will prepare the Response to Comment on Draft Negative Declaration. To comply with CEQA, DTSC, as a Responsible Agency, will consider the Initial Study and the Negative Declaration prepared by the Port in DTSC's decision to approve the proposed remedies and Closure Plan. If DTSC concludes that the Port's Initial Study and Negative Declaration adequately address the potential impacts of the Closure Plan and proposed remedies, DTSC will file a Notice of Determination with the Governor's Office of Planning and Research upon project approval.

1. Introduction

In April 1992, DTSC issued to Gibson / Pilot Joint Venture (later known as Gibson Environmental Inc.) an Interim Status Document (ISD) authorizing the handling of oily hazardous wastes at 475 Seaport Boulevard in the Port of Redwood City. As a condition of that authorization, the facility was required to investigate and address all historical releases of hazardous waste and constituents that may have occurred at the site in accordance with California corrective action process requirements.

This Statement of Basis is a public participation document which describes the basis for the DTSC's tentative remedy selection and identifies the media cleanup standards. The Statement of Basis describes the proposed remedy, but does not select the final remedy. This approach allows for additional information to be considered during the public comment periods. The Statement of Basis:

- Describes the nature and scope of the site investigation
- Describes the remedies that were considered
- Identifies and discuss the remedies proposed for selection
- Explains the reasons for selecting the proposed remedies
- Solicits public review and comments on the proposed remedies
- Provides information on how the public can be involved in the remedy selection process.

To recover portions of the cleanup costs incurred from potentially responsible parties, under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C Section 9601, the Port has requested DTSC use terminology and make reference to the CERCLA process and terminology as set forth under the National Contingency Plan (NCP).

The following depicts the parallelism between RCRA corrective action and NCP:

Milestones	RCRA Corrective Action Program	National Contingency Plan (NCP)
Initial Site Assessment	**RCRA Facility Assessment (RFA)**	**Preliminary Assessment/Site Inspection (PA/SI)**
Site Investigation	**RCRA Facility Investigation (RFI)**	**Remedial Investigation (RI)**
Evaluation of Remedial Alternatives	**Corrective Measures Study (CMS)**	**Feasibility Study (FS)**
Remedy Approval	**Remedy Selection**	**Remedial Action Plan (RAP)**
Remedy Implementation	**Corrective Measures Implementation (CMI)**	**Remedial Design/Remedial Action (RD/RA); Remedy Operation and Maintenance**

2. Public Participation

The Port of Redwood City (Port) has submitted several reports, most importantly:

- RCRA Facility Investigation Report dated March 27, 2003;
- Health Risk Assessment dated February 2004;
- Corrective Measure Study/Remedial Action Plan (CMS/RAP), dated April 29, 2005; and,
- Draft Closure Plan, dated December 2004 with revisions of June 17, 2005

DTSC conducted technical review of above mentioned reports and finds the reports to contain complete and technically accurate information. DTSC also reviewed the Initial Study and Draft Negative Declaration prepared by the Port for this project.

DTSC is now formally soliciting public comments on these documents during a 45-day comment period. If DTSC approves the Closure Plan and the proposed remedies discussed in CMS/RAP, the Port would be authorized to implement the remedies recommended in these documents and summarized in this Statement of Basis.

Public input on the proposed corrective action remedies, and on the information that supports the selection of those remedies, is an important contribution to the selection process. After DTSC receives all public comments, DTSC will make the final remedy determination. The final remedies selected could be different from those that have been proposed, depending on the information that is received through the public participation process.

The CMS/RAP, RFI Report, and Health Risk Assessment, used as the source of information for this Statement of Basis and other documents are available for review at:

REDWOOD CITY PUBLIC LIBRARY
Reference Desk
1044 Middlefield Road
Redwood City, California 94063.
(650) 780-7026

The complete administrative records will be available for public review at:

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
700 Heinz Avenue
Berkeley, California 94710
(510) 540-3957

In addition, the Statement of Basis is also available on the DTSC website at:

http://www.dtsc.ca.gov/HazardousWaste/

To be considered in the decision making for this Project, all comments on the proposed draft Closure Plan and remedy selection should be received, at the following address:

Walter Bahm, P.E.
Hazardous Substances Engineer
Standardized Permitting and Corrective Action Branch
Department of Toxic Substances Control
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To obtain additional information or have questions regarding the former Gibson Environmental Facility, the following individuals should be contacted:

Mr. Randy Sturgeon Public Participation Specialist DTSC (916) 255-3649	Mr. Walter Bahm Hazardous Substances Engineer DTSC (510) 540-3957	Mr. Don Snaman Manager of Operations Port of Redwood City (650) 306-4150

3. Background

3.1 Facility Description

The Port of Redwood City (Port), a five-wharf deep water port, is located 18 nautical miles south of San Francisco. The Port is less than three miles east of U.S. Highway 101 on former marshland along the San Francisco Bay. The Port has an active connection to the Union Pacific Railroad. The Port specializes in bulk and liquid cargoes. More than 15 businesses currently lease space from the Port and operate on the Port property.

The five-member Board of Port Commissioners, which is appointed by the Redwood City Council, governs the Port. The Redwood City Charter gives the Port Commission the authority to set policy and manage the Port, including budgetary policy and the selection of the Executive Director.

The former Gibson Environmental Inc., Port of Redwood City Facility (Gibson, Facility, or Site) is identified by assessors parcel number 054-300-530. It is an 8.9-acre portion of the larger 200-acre Port of Redwood City property. The Site is accessed and bordered by Seaport Boulevard on the east, Henry A. Beeger Road on the north with office buildings on the west and south sides. The site is within two miles of salt ponds, wetlands, Redwood Creek and the San Francisco Bay. The surrounding land is zoned for mixed commercial, industrial, and recreational uses.

Improvements consist of an earthen berm of imported soil, nine above ground storage tanks, an above ground vapor recovery tank, associated pipelines, ancillary equipment, a two-story office building with an attached warehouse, two underground storage tanks and a truck loading facility shown in Figure 4. The capacity of the bulk storage tanks ranges from 570,000 gallons (Tank 30721) to 5,500,000 gallons (Tank 30998). The tanks range in diameter from 45-feet to 140-feet with heights ranging between 48 and 50-feet. All bulk storage tanks have fixed roofs, with six having internal floating roofs for vapor control. The vapor recovery system, installed in 1967, consists of a 550-gallon underground storage tank and an 84,051-gallon steel above ground storage tank.

In 1963 Texaco leased the property from the Port of Redwood City to establish a liquid bulk storage terminal (LBT) with nine large aboveground storage tanks made of welded steel. Large equipment for transferring and dispensing of fuel, primarily gasoline and jet fuel were also constructed. The tanks are connected to Wharf 5 by an above ground piping system and a truck loading terminal for dispensing fuel to tanker trucks.

Based on historical records, the tanks are supported on concrete-capped pile structures. The tank bottoms rest on 5-feet of granular fill and are supported by a 1-foot 3-inch thick concrete cap set on an array of 65-foot deep wooden pilings driven into Old Bay Mud. Many of the releases were identified during agency inspections. Details regarding releases are available in the Preliminary Assessment/Site Investigation Report. The main documented subsurface releases to the soil and/or groundwater include:

- *1971 Jet Fuel Spill:* 1,700 gallons of jet fuel spilled near the Truck Rack after a power failure affected one of the rack loading arms. There was no documented cleanup.

- *1988 Jet Fuel and Oily Water in Excavation*: The 9,600-gallon diesel UST next to the Truck Rack was removed in 1988 and jet fuel and oily water were encountered in the excavation. About 9,600 gallons of oily water, 200 gallons of oily sediment and 80 cubic yards of contaminated soil were removed from the tank excavation. One of two recovery wells extracted approximately 3,000 gallons of contaminated water.

- *1989 Tanks 31000 and 30721 Pitted Bottoms:* Tank 31000 (stored jet fuel) and tank 30721 (stored gasoline) were taken out of service in 1989 because the bottom steel plates were found to be heavily corroded and pitted during cleaning. New tank bottoms and leak detection systems were installed between1989-90.

- 1*990-1991 Equipment Leaks*: Several valve, gasket and pipeline leaks associated with Tanks 30721, 30998, and 30999 were identified during several DTSC inspections conducted between November 1990 and June 1991.

- *1991 to 1995 Removal of Free-Phase Product:* Free-phase petroleum product was found in the vicinity of well MW-3 located adjacent to Tank 31000. From 1991 to 1995, an estimated 133,000 gallons of groundwater containing about 192 gallons of free-phase product was periodically extracted from MW-3.

- *1994 Tank 30720 Mixer Leak and Sludge Spill:* DTSC inspections identified a mixer leak at Tank 30720 that had been occurring for several years. During removal of the mixer in 1994, sludge spilled out of the tank manway and onto the ground. The reported volume of sludge spilled was 2,500 gallons and a vacuum truck was used to remove the sludge.

- *1995 Hydrogen Peroxide Spill:* Tank 30954 was being treated with hydrogen peroxide when a PVC pipeline burst which was connected to a tank containing 50 percent hydrogen peroxide. Approximately 4,500 gallons of hydrogen peroxide and rainwater were removed from the ground using a vacuum truck and disposed offsite.

The site is presently inactive and surrounded by a 6-foot high chain-link fence with barbed wire on top and a locking access gate.

3.2 Gibson's Hazardous Waste Management History

In 1983 Pilot Petroleum Corporation leased the property from the Port. Forming a joint partnership with Gibson Environmental Inc. in 1988, the site was used for petroleum waste treatment and storage. By 1990 Gibson became a commercial hazardous waste treatment and storage facility due to regulatory changes. From 1992 to 1995, Gibson operated under an Interim Status Document (ISD) issued by DTSC to store and treat hazardous waste consisting of oily water, sludge, etc. The ISD allowed Gibson to store and treat hazardous wastes from offsite sources.

Gibson abandoned the Site in October 1995 leaving approximately 10 million gallons of hazardous waste in the tanks. The Port, as owner of the property, has assumed responsibility for the cleanup and closure of the site under a Consent Order issued by DTSC in 1998. Currently, the Port is in the process of closing the site and will redevelop the property as an industrial maritime bulk commodity facility.

3.3 Environmental Setting

Redwood City is located in the San Francisco Bay Area, 25 miles south of San Francisco, and 27 miles north of San Jose. It is approximately 19 square miles in land area with a mean elevation of 15 feet above sea level. In the 2000 U.S. Census the City was recorded to have a population in excess of 75,400.

The former Gibson facility (Gibson, Facility or Site) is bound by Seaport Boulevard on the east, Henry A. Beeger Road on the north and office buildings on the west and south sides. The area within one mile of the Facility includes wetlands and the San Francisco Bay. The land use for surrounding land is zoned for mixed commercial, industrial, and recreational uses.

The Facility occupies a parcel of the Port property and is connected by piping to Wharf 5. The Facility is bordered on the north by a chemical manufacturing facility, to the west and south by two- and three-story office complexes and evaporative salt ponds to the east. Ground surface elevations range from 5 to 8 feet above mean sea level, with the earthen berms rising at 9.5 to 10.5-feet above mean sea-level. Groundwater is encountered within 2 to 7 feet below the ground surface.

Two public recreational marinas are located 300 to 400 feet west and south of the Facility along Redwood Creek. Live-aboard boat residence exists in the marina to the west.

The Site and surrounding area lie on a peninsula at the edge of San Francisco Bay formed by placement of artificial fill on interbedded clays and silts locally known as Bay Mud. The Site is underlain by fill, Bay Mud, alluvial and basin deposits, and Franciscan Formation bedrock.

Three groundwater zones have been identified at the Site and surrounding area including a shallow groundwater, a deeper groundwater and a deep groundwater. The top of the shallow groundwater at the Site is at depths ranging from approximately 2 to 7 feet below ground surface. The groundwater in the uppermost aquifer beneath the Site is brackish with a high level of total dissolved solids (TDS). In a letter dated December 22, 1999, the San Francisco Bay Region Water Quality Control Board stated to DTSC that groundwater exceeding 3,000 mg/l of TDS does not qualify as a potential source of drinking water.

Surface and subsurface drainage is ultimately into the San Francisco Bay. Redwood Creek is just west and north of the site and discharges into the San Francisco Bay. Surface and stormwater from the site drain into the eastern drainage swale. This swale is approximately 6 feet wide and flows south discharging into Redwood Creek near the Redwood City Marina. The Redwood City channel, at the foot of Redwood Creek, is a federally managed

navigation channel maintained at minus 30 feet mean lower level water (MLLW) depth datum. The eastern drainage swale is tidally influenced and has water in it throughout the year.

Storm water within the tank farm tends to pond in localized areas and drain to the eastern portion of the site. Storm water flows into the sump located near Tank 30720, then flows through an oil-water separator prior to discharging into the eastern drainage swale.

4. RCRA Facility Assessment /Preliminary Assessment

In the RCRA Corrective Action program, the initial site assessment is called the RCRA Facility Assessment (RFA). During the RFA, investigators identify and evaluate solid waste management units (SWMUs) and other areas of concern for releases to all media. In addition, investigators determine the need for further investigation and interim measures. If the facility poses a threat to human health or the environment, investigators may require corrective action either by a corrective action order or through the facility's permit conditions.

In the Superfund program, this phase is called the Preliminary Assessment (PA)/Site Inspection (SI). U.S. EPA or a state authority conducts a PA on a site listed in the Comprehensive Environmental Response, Compensation, and Liability Information System. The PA is generally limited in scope and consists of collecting available information and conducting a site reconnaissance. The purpose of the PA is to determine whether the site may pose a threat to human health and the environment. If investigators determine through the PA that further investigation is needed, then an SI will be initiated. During the SI, investigators usually collect environmental measurements to determine what hazardous substances are present at the site and whether or not they are being released to the environment. One objective of the SI is to provide a basis for ranking the site's hazards for possible placement of the site on the National Priorities List (NPL). A second objective of the SI is to determine if the site poses any immediate health or environmental risks and requires emergency response.

On April 28, 1993, DTSC completed a RFA, which evaluated past operating practices and historical uses of the site. It identified where spills, leaks, or other chemical releases either occurred or could have occurred. Any discernable waste management unit, e.g. tanks, containers, etc. at a hazardous waste management facility from which hazardous constituents might migrate, irrespective of whether the unit was intended for the management of solid and/or hazardous waste is defined as a Solid Waste Management Unit (SWMU). Releases at SWMUs are defined as routine, systematic, and deliberate discharges from process areas. An area of concern (AOC) is an area (e.g. product storage area, tanks and/or production equipment) where there may have been a release of a hazardous constituent(s). The RFA also is to determine whether there is any threat to human health and the environment at a facility.

The 1993 RFA identified 18 SWMUs that either had released or might have released hazardous waste or hazardous waste constituents into the environment. In addition, an AOC was identified in the March 2003 RCRA Facility Investigation Report. All 18 SWMUs and AOC are listed in Table 1.

5. Interim Remedial Measures

Interim Remedial Measures (IRM) are actions that can be taken at any time during the corrective action process to reduce or eliminate imminent threats to human health or the environment. These measures are to control, stabilize or eliminate further release(s) or potential release(s) of hazardous wastes or hazardous waste constituents at or from a facility.

Under the Consent Order HWCA 97/98-2015 dated May 6, 1998, and Interim Measures (IM) Workplans, the Port contracted for the completion the following interim measures:

1) Removal activities between 1999 and 2001 to remove approximately 9.65 million gallons of oily wastewater and 900,000 gallons of ignitable waste oil, from nine aboveground storage tanks. Wastes were sampled and sent to permitted off-site disposal facilities pursuant to a DTSC approved Workplan dated May 19, 1999.

2) Removal of approximately 200,000 gallons of waxy paraffin-like material from two storage tanks and the disposal at off-site permitted facilities in 2002. This action was approved by DTSC on December 23, 2002 as an IM Workplan Amendment.

6.

RCRA Facility Investigation / Remedial Investigation

The general objective of the RCRA Facility Investigation (RFI) and its CERCLA equivalent the Remedial Investigation (RI) is to thoroughly evaluate the nature and extent of releases of hazardous waste and constituents. The RFI investigates the SWMUs, AOC, and other source areas at the facility. The RFI and RI must include characterization of the facility (process, waste management, etc.), environmental setting, source areas, nature and extent of contamination, migration pathways (transport mechanism) and all potential receptors. The RFI characterizes the nature and extent of any contamination in and around the facility with soil and groundwater samples. The investigation evaluates whether hazardous wastes or hazardous waste constituents have migrated or may migrate from the facility into the environment through the following pathways: soil, groundwater, and air. Secondary objectives include:

- Characterizing the geology and hydrogeology;
- Characterizing the potential pathways of contaminant migration;
- Identifying any actual or potential receptors;
- Gathering all data to support a risk and/or ecological assessment;
- Gathering all necessary data to support interim corrective measures to stabilize ongoing releases and prevent further contaminant migration; and
- Gathering all necessary data to support the Corrective Measures Study. This could include conducting pilot, laboratory and/or bench scale studies to assess the effectiveness of a treatment method.

Between 1998 and 2004 the Port, under the Consent Order, investigated the extent of soil and groundwater contamination at the Site. DTSC approved the RFI Workplan on May 19, 1999 and subsequent amendments on December 23, 2002. The RCRA Facility Investigation/Remedial Investigation Report (RFI Report) was approved on March 5, 2004.

The RFI Report concluded that free phase product of total petroleum hydrocarbon (TPH), semi-volatile organic compounds (SVOCs), VOCs, metals and fuel additives were discovered in the subsurface soils and in groundwater at the Site (see Figure 5). The RFI findings are summarized as follow:

1) The shallow soil and shallow groundwater are contaminated primarily with petroleum hydrocarbons and some metals.

2) Contamination in the shallow groundwater does not appear to have migrated to the deeper groundwater, or laterally offsite.

3) Petroleum hydrocarbons generally include gasoline, diesel, jet fuel, and other associated chemicals such as benzene, ethylbenzene, toluene and xylenes (BTEX).

4) Other non-petroleum contaminants have been detected at limited areas of the Site (e.g., tetrachloroethene [PCE] at one soil location).

The Site contaminants of concern (COCs) and the maximum and minimum concentrations detected are provided in Table 2.

Based on RFI findings, the Port was required to prepare a Corrective Measures Study proposing additional corrective action.

7. Ecological and Human Health Risk Assessments

The results of the RFI were used to evaluate potential risk to human and ecological receptors. The data also formed a basis for a preliminary evaluation of proposed remedial technologies. The Port completed both an Ecological Risk Assessment (ERA) and a Human Health Risk Assessment (HHRA) in accordance with DTSC's approved guidance.

The ERA evaluated the potential for chemical contaminants detected in soil, soil gas, and groundwater to adversely affect the reproduction, growth, or survival of plant and wildlife individuals and populations (ecological receptors). The ERA concluded that no adverse impacts exist for ecological receptors from exposures to chemicals in soil, groundwater, or surface waters at the Port. DTSC approved the ERA on June 15, 2004. DTSC concluded that the ERA was conducted in accordance with DTSC guidance and no special status plant species were identified at the site and no special status animal species were expected to regularly appear at the site. There are no complete exposure pathways to ecological receptors.

The HHRA estimated risk to human health from potential exposure to chemicals in soil, soil gas and groundwater. The HHRA identified the current and reasonably likely land use at the Port as industrial-type land use. The potential receptors associated with this land use scenario are landscape/ maintenance workers, construction workers and commercial/industrial workers. Off-site receptors (i.e., local residents) were not evaluated in the HHRA because there was no complete exposure pathways to those individuals and none are anticipated in the future.

The HHRA also addressed protection of beneficial uses of groundwater by comparing chemicals of concern concentrations to drinking water standards. The HHRA determined additional removal actions where necessary. DTSC accepted the HHRA on July 20, 2005. Potential excess lifetime cancer risks and the likelihood of adverse noncancer health effects were evaluated based on potential exposures to COCs [also referred to as chemicals of potential concern (COPCs)] in each medium of concern and for each of the future receptors. The total excess cancer risk (R) and the total noncancer hazard index (HI) are summarized below for each of the potential receptors:

Construction Worker:	$R = 4.5 \times 10^{-6}$, HI = 1.41
Landscape Maintenance Worker:	$R = 4.6 \times 10^{-6}$, HI = 0.33
Commercial/Industrial Worker:	$R = 7.4 \times 10^{-5}$, HI = 2.11

From the results above, it is apparent that some remedial or corrective actions for the site will be necessary since the cancer risk is greater than 10^{-6}, and Hazard Index greater than 1.

8. Media Cleanup Standards

Media Cleanup Standards (MCSs) were developed to address both risk-based and regulatory-based objectives. Risk-based MCSs were developed using an institutional land-use scenario, consistent with the current and reasonably foreseeable future land use at the facility. Risk-based MCSs are applicable to soil and groundwater throughout Port. Table 2 lists MCSs of COCs.

9. Corrective Measures Study and Remedy Selection

The general objective of the Corrective Measures Study (CMS) and its CERCLA equivalent the Feasibility Study (FS) is to develop and evaluate corrective measure alternative(s) that may be utilized at the facility to address releases of hazardous waste or constituents from the SWMUs, areas of concern, and other sources areas at the facility. The information collected during the RFA, RFI and CMS phases will be used to determine which technologies to use during the Corrective Measures Implementations. With adequate forethought during the RFI, certain technologies may be adequately screened or eliminated from the CMS decision process with a minimum outlay of time and expense.

DTSC initiates remedy selection upon approval of the CMS Report. During the Remedy Selection Phase of the corrective action process, DTSC will evaluate and identify the proposed remedy, receive and respond to public comments, and select the final remedy. Analogous to the CERCLA Remedial Action Plan (RAP), the CMS Report proposes a final site remedy.

The CMS intends to evaluate risk and alternatives to remediate the Site contaminants in the soil gas, soil, and groundwater. In its remedy selection process the CMS uses the following nine criteria to evaluate corrective action alternatives as follows:

1) Be protective of human health and the environment;
2) Attains media cleanup standards;
3) Controls the sources of releases;
4) Meets all applicable waste management requirements
5) Short- and long-term effectiveness;
6) Reduction of toxicity, mobility and/or volume;
7) Long-term reliability;
8) Implementability; and,
9) Cost.

9.1 Corrective Measure Study/Remedial Action Plan (CMS/RAP)

The Port submitted the draft CMS/RAP, dated April 29, 2005 which evaluated the remediation of the Site contaminants in the soil, groundwater and soil gas. All 18 SWMUs and one AOC are included in the site-wide remediation proposal. The greatest quantity of contamination is the floating hydrocarbon product in the groundwater, depicted in Figure 5.

Four principle source areas are addressed and include:

1) Truck Rack Area due to free-phase petroleum product in soil and groundwater:

2) Three hot spots areas:

   i) Petrox Tank Area
   ii) next to the 6,000-gallon underground storage tank
   iii) at GWP-9 located southeast of Tank 30953

Because the free-phase petroleum product is bound within the soil and does not readily flow, the total volume of recoverable free-phase petroleum product is estimated to be on the order of approximately 5,000 gallons.

9.2. Evaluation of Corrective Measure Alternatives

The general remedial action objective for this site is to eliminate or reduce potential exposures to receptors such that excess cancer risks are less than 10^{-6} and that a noncancer hazard index is less than the threshold value of 1. The objectives can be met by either reducing residual concentrations of risk drivers to concentrations less than the risk-based target levels or to break the exposure pathways for the risk drivers to preclude potential exposure.

The first step in the selection of the proposed corrective measures was compilation of a list of potentially applicable alternatives. These alternatives were screened to eliminate those that were considered ineffective or not applicable under Port site-specific conditions (i.e. low permeability soils, developed areas, topography etc.).

Numerous technologies were identified as appropriate for Site remediation. The following technologies were considered and evaluated based on the contaminants of concern (benzene and PCE as the risk drivers), the media impacted (soil, soil gas and groundwater) and the anticipated success of the remedial technologies:

1) Soil Gas: Dual Phase Extraction and Soil Venting.

2) Soil: Excavation; In-situ stabilization; capping (asphaltic concrete and/or concrete);

3) Groundwater: Enhanced Bioremediation (e.g., Oxygen Releasing Compounds);

4) Barrier Wall, Pump and Treat (skimming LNAPL from collection trenches and treating groundwater with granular activated carbon); and Monitored Natural Attenuation (Passive Remediation); and,

5) Other: Institutional Controls.

The preferred appropriate remedial technologies for use in developing remedial alternatives include the following:

1) Excavation to remove LNAPL and contaminated soil with off-site disposal at appropriately permitted facilities;

2) Enhanced bioremediation with the addition of Oxygen Releasing Compounds (ORC); and,

3) Surface capping.

These technologies may be implemented individually or in combination to achieve the remediation goals. Additionally, because these treatment technologies may leave varying concentrations of residual contaminants, the remedial alternatives may include, as appropriate, long-term groundwater monitoring, long-term soil gas monitoring and administrative deed restrictions regarding future land use.

9.3. Summary of Proposed Remedies for Soil and Groundwater Contamination

The CMS/RAP evaluated four (4) alternatives of remedies, based on the fact that all SWMUs, including the ISD regulated bulk storage tanks and ancillary equipment and structures, will be torn down and removed from the Site as described in the Closure Plan. The main office/warehouse building and associated features such as the parking lot, fencing, storage shed, and electrical panel will remain intact and must be addressed in the remedial alternative selected for the Site.

9.3.1 Alternative 1 – No Further Action

This alternative assumes no remediation but does include monitoring the 19 existing groundwater wells currently in place at the Site for a period of 30 years. It does not include actions to reduce or control the amount of COCs. Evaluation of this alternative involves identification of the existing or potential exposure pathways and impacts to receptors at and near the Site. The “No Further Action” alternative is required to provide a baseline for comparing other alternatives. This alternative is not intended to be a viable approach.

9.3.2 Alternative 2 – Cap LNAPL Area and Hot Spots and Monitor Groundwater and Soil Gas

Under this alternative, the LNAPL area at the Truck Rack Area and two of the three hot spots would be capped with an engineered, permanent asphaltic concrete cap. An engineered cap would break the exposure pathway for outdoor air emissions, fugitive dust emissions and dermal contact with groundwater. The cap also reduces rainwater infiltration directly into the LNAPL and hot spot areas. The third hot spot near the 6,000-gallon UST does not require a cap since the area will be remediated as part of the removal of the 6,000-gallon UST during the Closure Plan activities.

Groundwater would be monitored using an estimated 10 of the 19 existing wells at the Site. The remaining nine (9) groundwater monitoring wells would be properly abandoned in accordance with the requirements of the San Mateo County Department of Environmental Health Services. In addition, up to three soil gas monitoring probes will be installed adjacent to the existing office building/warehouse for monitoring soil gas intrusion. Because this alternative leaves COCs in the ground at concentrations that exceed levels protective of human health and the environment, additional institutional controls such as a land use deed restriction would be required.

9.3.3 Alternative 3 – Install Extraction Trenches, Cap LNAPL Area and Hot Spots and Monitor Groundwater and Soil Gas

This alternative considers removal of the free-phase component of LNAPL by using a series of collection trenches (approximately three trenches spaced about 40 feet apart) within the LNAPL area at the Truck Rack Area. The LNAPL would be removed using automated pumps and skimmers. No groundwater would be extracted. The LNAPL would be disposed offsite at an approved recycling facility and the excavated contaminated soil from the trenches would be disposed offsite. Once the LNPL recovery is completed, the collection trenches would be backfilled, and an engineered, permanent asphaltic concrete cap would be constructed over the LNAPL area. In addition, an asphaltic concrete cap would be placed over two of the three hot spots. The engineered cap would break the exposure pathway for outdoor air emissions, fugitive dust emissions and dermal contact with soil and groundwater that contains residual contaminants. The third hot spot at the 6,000-gallon UST does not require a cap since the area will be remediated as part of the removal of the 6,000-gallon UST during the Closure Plan activities.

Groundwater would be monitored using 10 of the 19 wells currently present at the Site. The remaining nine (9) wells would be properly abandoned. Up to three soil gas probes would be installed and monitored next to the existing office building/warehouse. Because this alternative leaves COCs in the ground at concentrations that exceed levels protective of human health and the environment, a deed restriction would be necessary.

9.3.4 Alternative 4 – Excavate LNAPL Area and Hot Spots, Perform Enhanced Biodegradation and Monitor Groundwater and Soil Gas

Alternative 4 is the most aggressive set of technologies. This alternative removes both free phase and residual components of LNAPL through excavation and pumping liquids that accumulate in the open excavation. This alternative assumes an average excavation depth of 7.0 feet at the Truck Rack area. Approximately 5,000 cubic yards (about 8,500 tons) of contaminated soil will be excavated from the LNAPL area and an additional 500 cubic yards (approximately 850 tons) of contaminated soil will be excavated from the three isolated hotspots. The excavated contaminated soil will be disposed offsite at a licensed landfill facility. Any contaminated soil that is saturated may require onsite pretreatment to reduce the moisture/liquid content prior to disposal offsite. After the soil is removed, the excavation will remain open for a short period of time to allow residual LNAPL from the surrounding soil to migrate into the excavation, be skimmed off and be transported to a recycling facility.

Confirmation sampling will be performed to achieve cleanup levels in the soil and groundwater at the LNAPL area and three hot spots. Extracted contaminated groundwater will be treated by filtering through an oil-water separator and/or a granular activated carbon (GAC) unit or other approved treatment method. The treated groundwater will be discharged under permit to the South Bayside System Authority (SBSA) sanitary sewer system. After floating product recovery and recharge of three pore volumes oxygen releasing compounds (ORC) will be applied into the pits, as needed, to enhance biodegradation of any remaining contaminants prior to backfilling the excavations.

Groundwater and soil gas monitoring wells will be monitored for as long as necessary to demonstrate that contaminant concentrations decline to health protective levels. Groundwater will be monitored using up to nine (9) of the 19 existing wells onsite and four

(4) additional wells that will be installed. The remaining 10 wells will be properly abandoned in accordance with the requirements of the San Mateo County Department of Environmental Health Services. Up to three soil gas monitoring probes would be installed adjacent to the existing office building/warehouse for monitoring soil gas intrusion.

The intent of this alternative is to remove COCs in the ground at concentrations that exceed levels protective of human health and the environment; however, a land use covenant may still be necessary until the enhanced bioremediation further reduces residual contaminants, if present, and the groundwater and soil gas monitoring confirms the remediation is complete.

The four alternatives were evaluated in the CMS/RAP against the following ten NCP criteria which are consistent with the criteria established for corrective action.

CMS/RAP Alternative NCP Evaluation Criteria	DTSC Corrective Measures Alternative Evaluation	
	Four Corrective Measures Standards	Five Decision Factors
1. Overall protectiveness of human health and the environment	1. Be protective of Human Health and the Environment	
2. Compliance with any applicable relevant and appropriate federal, state and local requirements (ARARs)	2. Attains media cleanup standards;	
3. Long term effectiveness		1. Long Term Reliability; Long term effectiveness
4. Reduction of toxicity, mobility or volume through treatment		2. Reduction of toxicity, mobility or volume
5. Short-term effectiveness, including potential risks to surrounding community and remediation workers		3. Short-term and long-term effectiveness
6. Implementability and technical feasibility		4. Implementability
7. Cost		5. Cost
8. Regulatory Acceptance	3. Meets all applicable waste management requirements	
9. Community Acceptance.		
10. California Health and Safety Code Criteria	4. Controls the sources of release(s) so as to reduce or eliminate, to the maximum extent practical, further releases that might pose a threat to human health and/or the environment	

10. Closure of Interim Status Document (ISD) Units

The closure of ISD units is a separate requirement under both the federal and state hazardous waste laws and regulations. The Port submitted a Draft Closure Plan describing the proposed closure activities, e.g. to remove waste residues, contaminated structures and equipment, including all aboveground tanks, containment systems, and contaminated soils in compliance with Chapter 15, Title 22, California Code of Regulations. Confirmation soil samples will be taken to demonstrate if releases from regulated ISD units have occurred. It is the desire of the Port to reuse the property. For the removal of hazardous waste and contaminated equipment, the following closure performance standards are proposed by the Port:

1. to clean tanks and equipment to be recycled as scrap metal;
2. to excavate soil to background, e.g. chromium (VI), or risk-based concentrations determined in the HHRA; and
3. to remediate residues in soil and groundwater to risk-based concentrations determined in the HHRA.

11. Conclusion

DTSC has reviewed the CMS Report/RAP and the remedial alternative proposed. These alternatives summarized earlier in Section 9 of this Statement of Basis, present varying degrees of site cleanup. Table 3 summarizes comparative analysis of the four alternatives documented in CMS Report/RAP.

Alternative 4, through the large excavation, assures the greatest removal of floating petroleum hydrocarbons from both soil and groundwater. The removal of groundwater and recharge of three pore volumes allows for natural soil flushing and drainage. The excavations also allows for the targeted in-situ delivery of ORC at great savings of time and cost. This alternative targets areas and contaminants of greatest potential human health risk and their removal and off-site disposal provides the greatest long-term level of protection. In addition, with the land use covenant (LUC) entered between DTSC and the Port, the Site can only be developed into commercial or industrial uses. This will minimize, for site occupants, the exposure to hazardous chemicals under future land use scenarios. DTSC will conduct annual inspections to ensure that the property use has been restricted to agreed-upon land use.

DTSC is proposing to select Alternative 4 as a final remedy for this site with the addition of a land use covenant (LUC) if residual concentrations remain above risk levels. This is because Alternative 4 provides the greatest overall protection of human health and the environment and compliance with Applicable or Relevant and Appropriate Requirements (ARARs). Although Alternative 4 has the highest anticipated cost of the alternatives evaluated, it meets the remedial objectives and allows greater possibilities for the Site to be redeveloped.

12 Key References

1. Department of Toxic Substances Control (DTSC) *Consent Order* (HWCA 97/98-2015). The Port of Redwood City (Port), Former Gibson Environmental Facility, Redwood City, California, EPA ID CAD043260702, May 6, 1998.

2. *Consent Order Supplement* (HWCA 97/98-2015A) – The Port of Redwood City (Port), Former Gibson Environmental Facility, Redwood City, California, EPA ID CAD043260702, September 2, 2004.

3. Federal Office of Management and Budget (FMB), Circular No. A-94, April 3, 2000.

4. McLaren Hart, *Interim Measures Work Plan*, Former Gibson Environmental, Inc., Redwood City Facility, Redwood City, California, March 30, 1999.

5. McLaren Hart, *Final Closure Plan*, Former Gibson Environmental, Inc., Redwood City Facility, Redwood City, California, January 7, 2000.

6. Regional Water Quality Control Board (RWQCB).*Status of Shallow Groundwater as Potential Source for Drinking Water,* Former Gibson Environmental Facility, Redwood City, California. Letter to DTSC, December 22, 1999

7. San Francisco International Airport (SFIA). Order No. 99-045 from the San Francisco Bay Regional Water Quality Control Board, October 31, 1999

8. Tetratech, Inc. *Groundwater Grab-Sample Survey, April 1993 Monitoring Event and Cleanup Progress Report, Gibson Oil/Pilot Petroleum Plant*, *Redwood City, California*, May 24, 1993.

9. Treadwell & Rollo. *Remedial Preliminary Assessment/Site Inspection (RCRA Facility Assessment),* Former Gibson Environmental Facility, Redwood City, California. February 2002.

10. Treadwell & Rollo. *Scoping Document and Conceptual Site Model*, Former Gibson Environmental Facility, Redwood City, California, May 2003

11. Treadwell & Rollo. *Remedial Investigation Report*, Former Gibson Environmental Facility, Redwood City, California. March 2004.

12. Treadwell & Rollo. *Revised Scoping Ecological Assessment Report*, Remedial Investigation Report (RCRA Facility Investigation Report), Former Gibson Environmental Facility, Redwood City, California. February 2004.

13. Treadwell & Rollo. *Revised Human Health Risk Assessment Report*, Remedial Investigation Report (RCRA Facility Investigation Report), Former Gibson Environmental Facility, Redwood City, California. February 2004.

14. Treadwell & Rollo. *Draft Closure Plan*, Former Gibson Environmental Facility, 475 Seaport Boulevard, Redwood City, California, December 2005.

15. Treadwell & Rollo. *Addendum to Human Health Risk Assessment*, Former Gibson Environmental Facility, Redwood City, California, March 14, 2002.

16. URS Corporation. *Interim Measures Work Plan Amendment,* Former Gibson Environmental Inc., Redwood City Facility, Redwood City, California, September 1996.

17. US EPA. *How To Effectively Recover Free Product At Leaking Underground Storage Tank Sites - A Guide For State Regulators*, EPA-510-R-96-001, September 1996.

Figure 1 - Site Location Map

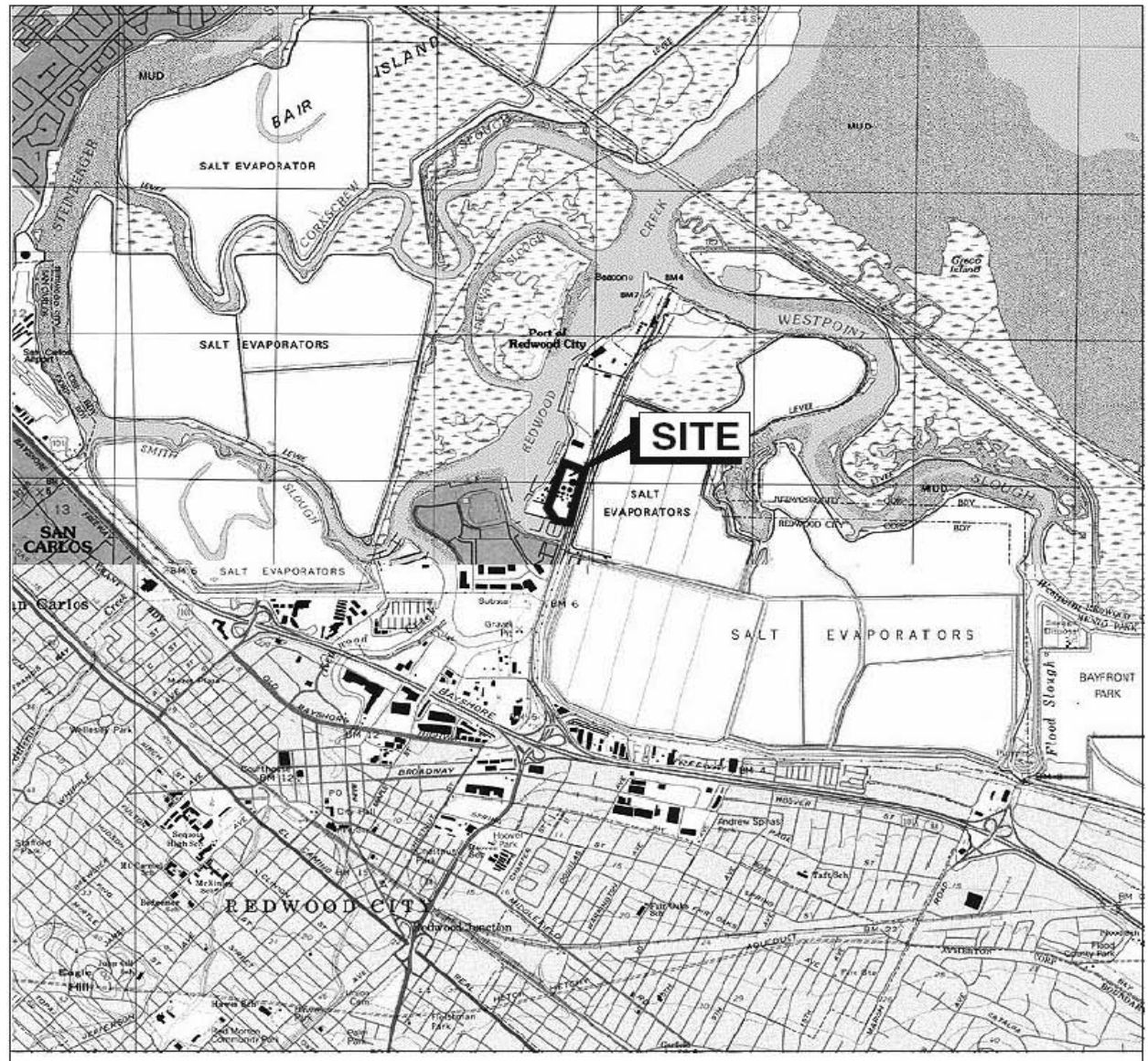

Figure 2 - Corrective Action Process Flow Diagram

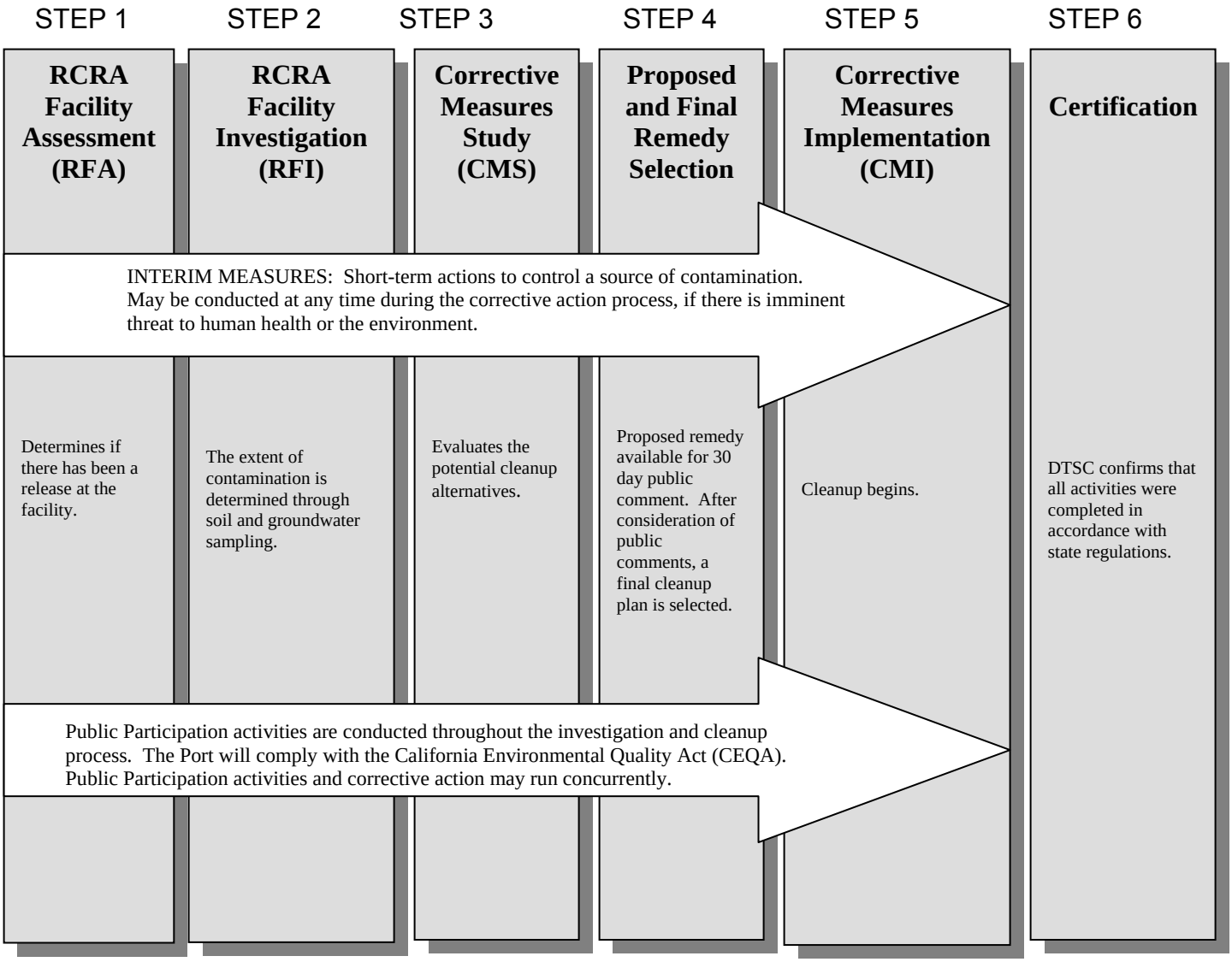

Figure 3 - Site Photo and Surrounding Land Use

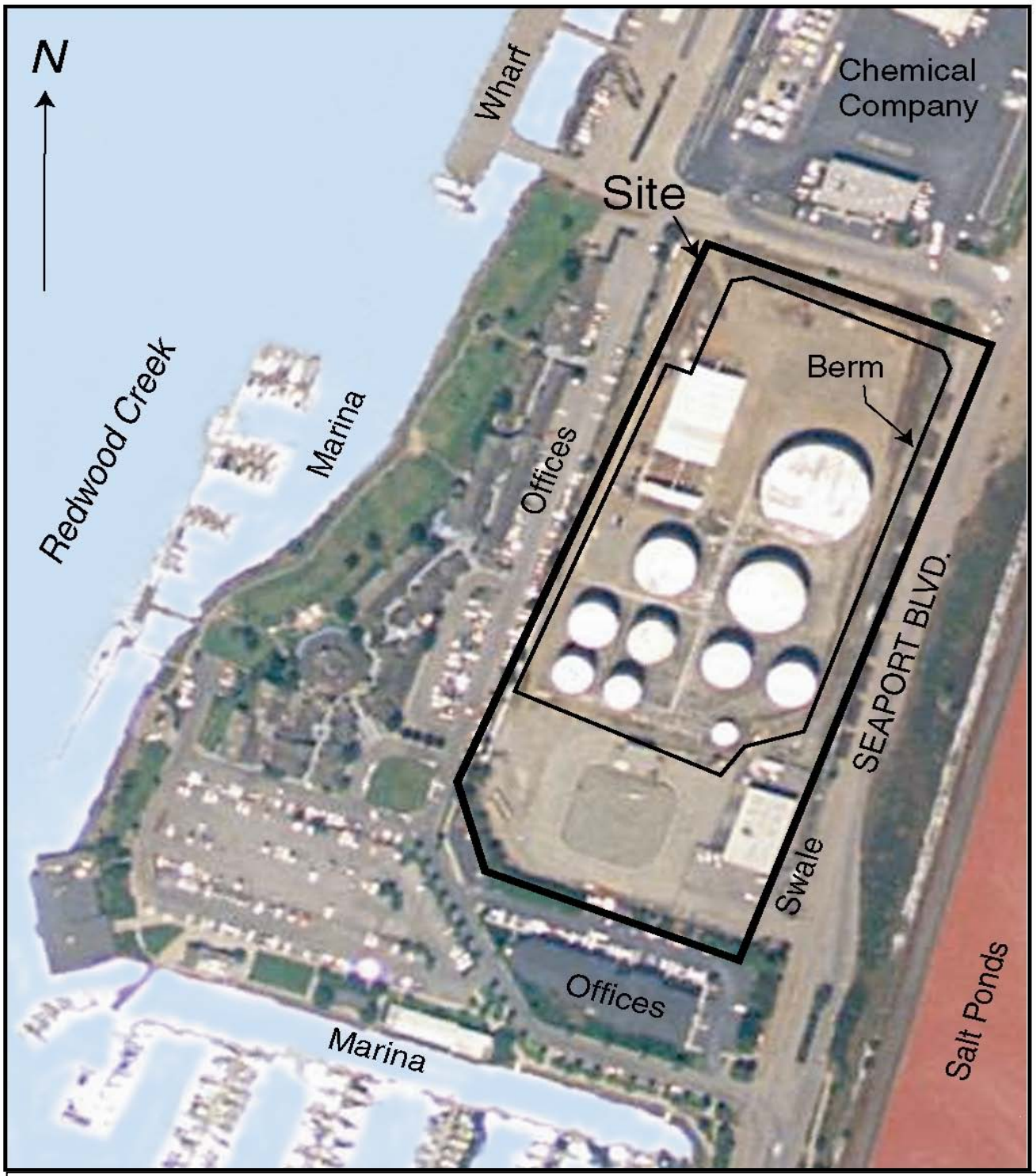

Figure 4 - Locations of Solid Waste Management Units

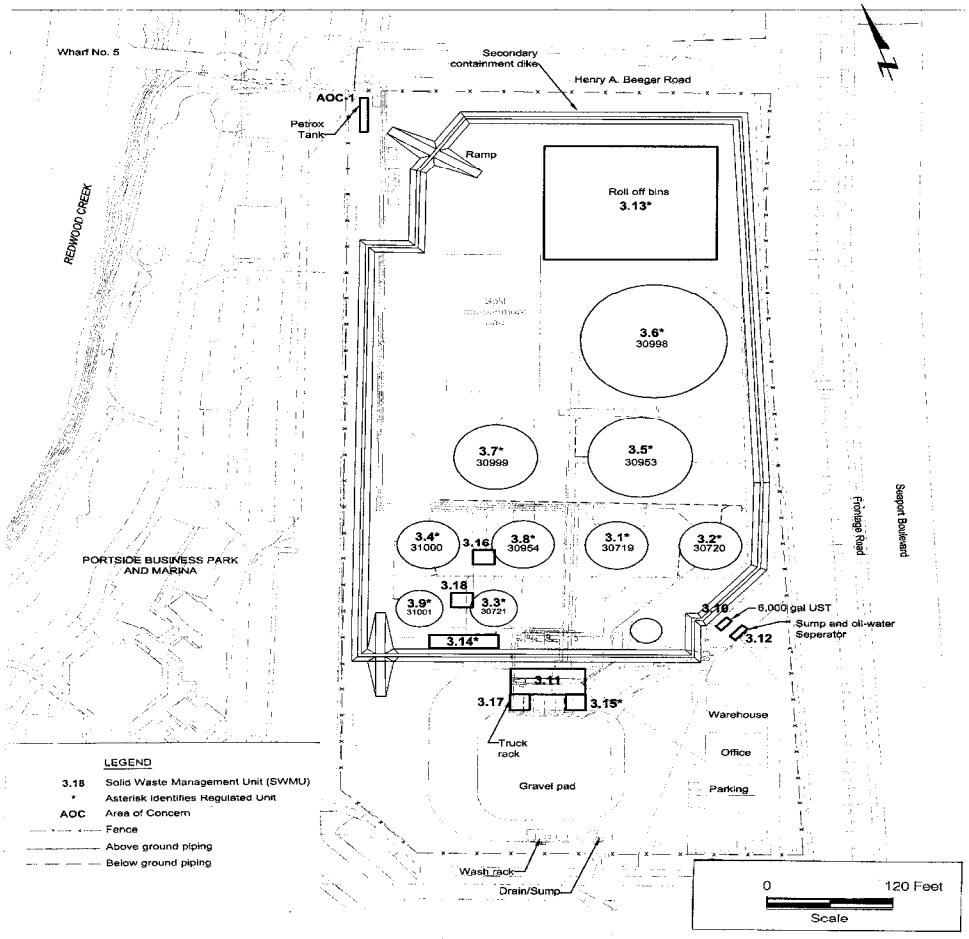

Figure 5 Areas requiring cleanup

Table 1 - SWMUs and AOC

SWMU Number	ISD Unit	Description
3.1	Yes	Tank 30719
3.2	Yes	Tank 30720
3.3	Yes	Tank 30721
3.4	Yes	Tank 31000
3.5	Yes	Tank 30953
3.6	Yes	Tank 30998
3.7	Yes	Tank 30999
3.8	Yes	Tank 30954
3.9	Yes	Tank 31001
3.10	No	Underground Containment Tank
3.11	No	Truck Loading Rack
3.13	Yes	Containers and Roll-off Bins
3.14	Yes	Granular Activated Carbon Units
3.15	Yes	Filter Units
3.16	No	Ultra Violet Treatment Units
3.17	No	Ozone Treatment Units
3.18	No	Dissolved Air Flotation Unit
AOC 1	No	Area near Petrox Tank

Table 2 - Site Contaminants of Concern and Cleanup Levels

Chemical	Minimum Soil Detection	Maximum Soil Detection	Soil Cleanup Level	Source of Level	Minimum Groundwater Detection	Maximum Groundwater Detection	Groundwater Cleanup Level	Source of Level	Minimum Soil Gas Detection	Maximum Soil Gas Detection	Soil Gas Cleanup Level	Source of Level
	(mg/kg)	*(mg/kg)*	*(mg/kg)*		*(mg/L)*	*(mg/L)*	*mg/L*		*ug/m3*	*ug/m3*	*ug/m3*	
Total Petroleum Hydrocarbons (TPH)												
TPH-gasoline	14	58000	9,600	A	0.052	960	100	A	NA	NA	NA	A
TPH-jet fuel	1.4	5100	11,000	A	0.059	150	20	A	NA	NA	NA	A
TPH-kerosene	ND	337	11,000	A	ND	12	20	A	NA	NA	NA	A
TPH-diesel	1.2	4700	8,900	A	0.054	150	20	A	NA	NA	NA	A
TPH-motor oil	7.2	310	8,900	A	0.82	0.82	10	A	NA	NA	NA	A
Volatile Organic Compounds (VOCs)												
Acetone	0.048	0.048	9.63	B	0.011	0.12	0.481	B	110	--	200	B
Benzene	0.036	30.3	0.0925	B	0.006	2.17	0.0081	B	33	1100000	377.5	B
2-Butanone	ND	ND	--	--	0.011	0.028	0.101	B	ND	ND	--	B
n-Butylbenzene	0.048	9.8	0.51	B	0.0019	0.06	0.0319	B	ND	ND	--	B
sec-Butylbenzene	0.049	2.8	0.21	B	0.0023	0.71	0.0374	B	530	11000	354	B
Carbon Disulfide	ND	ND	--	--	0.0005	0.019	0.0702	B	ND	ND	--	B
Chloroform	ND	ND	--	--	0.0007	0.007	0.0205	B	ND	ND	--	B
Diisopropyl Ether	ND	ND	--	--	0.0021	0.0021	0.0463	B	ND	ND	--	B
Ethylbenzene	0.016	172	5.65	B	0.0006	15	0.386	B	550	150000	16900	B
Isopropylbenzene	0.037	2.9	0.91	B	0.0011	0.58	0.0369	B	2700	2700	445	B
para-Isopropyltoluene	0.043	4.2	0.94	B	ND	ND	--	B	ND	ND	--	B
Methylene Chloride	ND	ND	--		ND	ND	--	B	19	19	249	B
Methyl tert butyl ether (MTBE)	0.0053	0.0077	0.36	B	0.0005	200	6.7	B	840	2000	492	B
Naphthalene	0.032	47	1.75	B	0.13	2.4	0.122	B	540	540	273	B
n-Propylbenzene	0.013	8.7	1.08	B	0.0009	1.5	0.081	B	740	2600	474	B
1,1,2,2-Tetrachloroethane	ND	ND	--	--	ND	ND	--	B	ND	ND	--	B
Styrene	ND	ND	--	--	ND	ND	--	B	ND	ND	--	B
1,2,4-Trichlorobenzene	ND	ND	--	--	1.2	1.2	0.0489	B	ND	ND	--	B
Trichloroethene (TCE)	ND	ND	--	--	0.0015	0.0015	0.0186	B	ND	ND	--	B
Tert-Butanol	0.006	14	3.34	B	ND	ND	--	B	ND	ND	--	B
Tert-Butylbenzene	0.0063	7.3	0.70	B	0.0017	0.16	0.0206	B	ND	ND	--	B
Tetrachloroethene (PCE)	3.4	3.4	0.43	B	0.11	0.11	0.0206	B	ND	ND	--	B
Toluene	0.13	18.2	0.67	B	0.00021	0.9	0.0195	B	590	90000	11200	B
1,2,4-Trimethylbenzene	0.0054	674	22.50	B	0.007	0.44	0.0291	B	510	85000	10900	B
1,3,5-Trimethylbenzene	0.025	155	5.61	B	0.0055	1.6	0.0624	B	500	600	278	B
Xylenes	0.14	948	38.1	B	0.0005	2.7	0.0768	B	550	170000	25900	B
m,p-Xylenes	0.011	28	4.54	B	0.0007	0.019	0.00357	B	550	170000	25400	B
o-Xylene	0.023	2.9	0.472	B	0.0095	0.0095	0.00164	B	840	47000	4240	B
Semi-Volatile Organic Compounds (SVOCs)												
2-Methylnaphthalene	44	44	3.04	B	ND	ND	--	B	ND	ND	--	B
Metals												
Antimony	ND	ND	*10.00*	C	ND	ND	--		--	--	--	
Arsenic	ND	ND	*5.00*	C	ND	ND	--		--	--	--	
Beryllium	ND	ND	*0.5*	C	ND	ND	--		--	--	--	
Cadmium	0.5	8	1.00	C	0.056	0.056	--		--	--	--	
Chromium	5.2	386	55.00	C	0.003	2.9	--		--	--	--	
Chromium VI	0.03	2.7	TBD		ND	ND	--		--	--	--	
Copper	6.2	106	70.00	C	0.013	2.1	--		--	--	--	
Lead	5	227	36.00	C	0.019	0.59	--		--	--	--	
Mercury	ND	ND	0.22	C	ND	ND	--		--	--	--	
Nickel	15	526	80.00	C	0.008	2.8	--		--	--	--	
Selenium	ND	ND	1.00	C	ND	ND	--		--	--	--	
Silver	ND	ND	1.00	C	ND	ND	--		--	--	--	
Thallium	ND	ND	5.00	C	ND	ND	--		--	--	--	
Zinc	6.9	121	88.00	C	0.014	3.3	--		--	--	--	

Notes:

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

ug/m^3 = micrograms per cubic meter

-- = Risk-Based Concentration to be determined if necessary

TBD - To Be Determined

ND = Not detected above the laboratory reporting limit

A = San Francisco Regional Water Quality Control Board Order No. 99-045 for the San Francisco International Airport

B = Preliminary Risk-Based Concentration for Screening from Revised Human Health Risk Assessment (Treadwell & Rollo, 2004a)

C = Background concentration from Final Closure Plan (McLaren Hart, 2000)

Risk-based concentrations may be revised to develop regulated unit-specific concentrations that account for cumulative risks or to account for institutional controls.

Table 3 - Comparative Analysis of Alternatives

Alternatives				
	Alternative 1 **No Further Action**	**Alternative 2** **Cap LNAPL Area and Hot Spots and Monitor Groundwater and Soil Gas**	**Alternative 3** **Install Extraction Trenches, Cap LNAPL Area and Hot Spots and Monitor Groundwater and Soil Gas**	**Alternative 4** **Excavate LNAPL Area and Hot Spots, Perform Enhanced Biodegradation, and Monitor Groundwater and Soil Gas**
DESCRIPTION	Groundwater monitoring of the 19 existing wells for 30 years and file a deed restriction.	Place a permanent asphaltic-concrete cap over the LNAPL area at the Truck Rack Area and hot spot areas; perform perimeter groundwater monitoring of 10 wells and monitoring of 3 soil gas probes for 30 years and file a deed restriction.	Dig temporary trenches in LNAPL area at the Truck Rack Area, pump/skim and treat LNAPL and dispose of the LNAPL and contaminated soil from the trenches at an offsite disposal site. Place a permanent asphaltic-concrete cap over the LNAPL area and hot spots; perform perimeter groundwater monitoring of 10 wells and monitor 3 soil gas probes for 30 years and file a deed restriction.	Excavate soil in LNAPL area at the Truck Rack Area and hot spot areas, and perform confirmation sampling to achieve cleanup levels in soil and groundwater. Pump/skim LNAPL from excavation, treat and dispose in sanitary sewer. Add ORC (enhanced bio) to excavations, as needed, prior to backfilling. Offsite disposal of LNAPL and contaminated soil. Perimeter groundwater monitoring of 10 wells and soil gas monitoring of 3 probes next to building/warehouse for up to 5 years. File a deed restriction as needed.
THRESHOLD CRITERIA				
1) Overall Protection of human health and the environment	Alternative not protective of human health and the environment.	Alternative provides some protection of human health and the environment by limiting surface exposure at the LNAPL Area and hot spots, but leaves LNAPL in-place.	Alternative provides significant protection of human health and the environment by removing free-phase LNAPL and limiting surface exposure, but leaves residual LNAPL.	Alternative is the most protective of human health and the environment by removing residual and free-phase LNAPL, and contamination at hot spots.
2) Compliance with ARARs	Alternative does not comply with ARARs. LNAPL and contaminated soil and groundwater left in-place will not comply with RCRA 40 CFR 264 and other requirements.	Alternative partly complies with ARARs. LNAPL and contaminated soil and groundwater left in-place at hot spots will not comply with RCRA 40 CFR 264 and other requirements.	Alternative partly complies with ARARs. LNAPL and contaminated soil and groundwater left in-place at hot spots will not comply with RCRA 40 CFR 264 and other requirements.	Alternative significantly complies with ARARs.

BALANCING CRITERIA				
3) Long-term effectiveness and permanence	Low: Alternative will not offer any long-term effectiveness and permanence if property is to be developed in the future	Moderate: Alternative may offer long-term effectiveness in the LNAPL and hot spot areas if the cap is maintained and land use controls imposed, although COCs left in place in LNAPL area and hot spots does not provide permanent protection.	Moderate: Alternative may offer long-term effectiveness in the LNAPL and hot spot areas if the cap is maintained and land use controls imposed, although COCs left in place at hot spots does not provide adequate protection.	High: This alternative offers long-term effectiveness and permanence. The media affected by COCs are no longer present.
4) Reduction of Toxicity, Mobility, or Volume through treatment	None: Alternative will not reduce toxicity, mobility or volume of COCs.	None: Alternative will not reduce toxicity, mobility or volume of COCs.	Moderate: Alternative will reduce volume of affected soil and LNAPL will be reduced by trenching and product recovery. Trenches may not remove sufficient LNAPL.	High: Alternative will achieve maximum reduction in volume of COCs and allow maximum extraction and treatment of affected groundwater.
5) Short-term effectiveness	Low: Alternative does not provide short term effectiveness.	Moderate: This alternative would provide short term effectiveness at the LNAPL and hot spot areas. Normal construction practices and OSHA standards would be employed to protect construction workers and the public.	Moderate: This alternative would provide short term effectiveness at the LNAPL and hot spot areas. Normal construction practices and OSHA standards would be employed to protect construction workers and the public.	High: This alternative would provide short-term effectiveness. Normal construction practices and OSHA standards would be employed to protect construction workers and the public.
6) Implementability	High: Alternative requires no remedial action.	High: The technical approach is clear and the remedy is readily implementable.	High: The technical approach is clear and the remedy is readily implementable.	High: The technical approach is clear and the remedy is readily implementable.
7) Cost	Low: $506,801	Low-Moderate: $950,728	Moderate-High: $1,971,614	High: $2,822,087
MODIFYING CRITERIA				
8) Regulatory acceptance	Low: The Department of Toxic Substances Control (DTSC) is not likely to accept this alternative.	Low: DTSC is not likely to favor this alternative as it does not fully comply with ARARs.	Low: DTSC is not likely to favor this alternative as it does not fully comply with ARARs.	High: DTSC is likely to favor the alternative, because the remedy is protective of human health and the environment, and complies with ARARs.

9) Community acceptance	Low: The community is not likely to accept this alternative due to the possibility of contaminants migrating offsite and future worker exposure.	Moderate: The community might accept this alternative but may be concerned with offsite migration of contaminants and future worker exposure.	Moderate: The community might accept this alternative but may be concerned with offsite migration of contaminants, future worker exposure and concerns about construction noise and odor issues	Moderate-High: The community is likely to favor this alternative as the most protective, but may have concerns about construction noise and odor issues.
ADDITIONAL CRITERIA				
California Health and Safety Code Criteria	The no-action alternative does not address the health and safety risks posed by the Site, the effect of contamination on future uses and groundwater resources at the Site, or the potential for migration of contamination from the Site.	This alternative addresses some of the health and safety risks posed by the Site and monitors for potential offsite contaminant migration. A future threat to groundwater may arise due to the continued presence of LNAPL and other COCs in the soil and groundwater.	This alternative addresses some of the health and safety risks posed by contamination at the site and monitors for potential offsite contaminant migration. However, a future threat to groundwater may arise due to the continued presence of residual LNAPL and other COCs in Site media.	This alternative addresses the human health and safety as well as ecological risks posed by contamination at the Site or offsite migration of contaminants. This remedy provides a cost effective remedial alternative for the Site. This alternative will include some land disposal of excavated wastes; however, the potential future threat to groundwater will be significantly reduced by removing these wastes from an uncontrolled Site.
RECOMMENDATION				
	Alternative is Not Recommended. Alternative is not protective of human health and the environment, and does not comply with ARARs.	**Alternative is Not Recommended.** This alternative does not adequately address COCs at the Site. The LNAPL and other COCs left in place pose an unacceptable risk to future land uses and to groundwater.	**Alternative is Not Recommended.** This alternative would not adequately address COCs in soil and groundwater. Residual LNAPL may pose a threat to groundwater.	**Alternative is Recommended.** This alternative is likely to be protective of human health and the environment and is likely acceptable to DTSC and the community. Although the cost is higher than the other alternatives, the maximum reduction in affected media is achieved and future risk is low.